Dispensing Errors: Preventable Medication Errors by Pharmacists in Outpatient Department, A University Hospital, Bangkok, Thailand

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***Abstract*— The study aimed to determine the frequency and types of dispensing errors identified by pharmacists in the final checking; to explore the work flow of the medication dispensing system at the Outpatient Department (OPD) department University hospital; and to make recommendation for their prevention using system and human approach. Study design was descriptive retrospectively and setting in a University hospital. Medication error data were collected from medication error reporting program. Workflow, input, process and output observations were employed as well. Data analyzed by descriptive statistics. During 28 days of study length, it was recorded 20,775 prescriptions or 741 prescription/day. Dispensing errors reported were 348 events (1.67%). Prevalence of prescribing error, dosage error, and preparation error were 44.8%, 32.2% and 25.9% respectively. Average item per prescription 3.8 item/prescription. Potential errors can be occurred when items of drug increasing. Work flow of dispensing system in OPD University hospital already integrated with medication error reporting system. Pharmacists developed and implemented Medication Error Program as an instrument to report the medication dispensing errors routinely. Dispensing errors reported by pharmacists must be seen by the pharmacy institution-related as opportunities to identify areas for improvement. Prevalence of dispensing errors seems low but it is urgent to encourage staffs for detection and prevent more of potential harmful. Pharmacist role in building good system to encourage medication errors detection, reporting and prevention might be considered to ensure the commitment of patient safety.**

Keywords: dispensing errors; pharmacist; prevention management

I. INTRODUCTION

Patient safety has become a major concern since the November 1999 release of the Institute of Medicine's (IOM) report, "To Err Is Human" [1, 2]. The IOM's report in 2006 indicated that medication errors are among the most common medical errors, harming at least 1.5 million people every year. The reports concluded that 400,000 preventable drug-related injuries occur each year in hospitals. The report noted that these are likely underestimates because the data excluded errors of omission such as the failure to prescribe medications for which there is an evidence base for the ability to reduce morbidity and morbidity [3]. Medication errors compromise patient confidence in the health-care system and increase health-care costs [4]. The problems and sources of medication errors are multidisciplinary and multi factorial [5]. Errors occur maybe from lack of knowledge, substandard performance and mental lapses, or defects or failures in systems [6]. Many medication errors are probably undetected since many medication errors maybe minimal consequence that adversely affected a patient. However, medication errors result in serious impact on patient's morbidity and mortality [7]. System enhancements and the checks and balances needed to proactively prevent medication errors as pharmacists and technicians prepare, dispense, and monitor the effects of medications. To prevent medications errors, change and improve the system is needed, not rely on changing people [8]. Effective systems for prescribing, dispensing, and administering medications should be established with safeguards to prevent errors. Dispensing errors are usually associated with poor safety and inefficient dispensing systems [9].

Currently, medication errors reporting program in a University hospital is still developed and improved, using medication error software program, particularly for identify dispensing error types. The center of reporting placed in 2nd floor outpatient department, and established at November 2011. Based on these fact, we conducted the study about medication errors, how to prevent using system and human approach. The study aimed to determine the frequency and types of dispensing errors identified by pharmacists in the final checking; to explore the work flow of the medication dispensing system at the Outpatient Department (OPD) department University hospital; and to make recommendation for their prevention using system and human approach.

II. METHOD

A. Study design

The study was descriptive retrospectively. The study was conducted in two part. The first, focus on analyzing the frequency of dispensing errors and classifying the errors identified at the final checking Secondly, concern on observation of work-flow of dispensing system in OPD and interview to Head of OPD during study period to arrange the recommendation for errors prevention.

B. Setting

The study setting was in Outpatient Department in second floor of University hospital, located in the Center of Bangkok, Thailand. There are 3 main health service buildings on the medical school campus which serve at least 5,000 out-patient visits per day and in-patients with more than 1,000 beds for medical care. The center of medication error reporting placed in 2nd floor outpatient department, and established at November 2011.

C. Definitions

Dispensing errors were classified into ten categories, prescribing error, entry error, preparation error, checking error, patient error, drug name error, dossage form error, dossages strength error, frequency error and quantity error. A dispensing errors was therefore defined as a prevented errors occured in outpatient pharmacy department, as a result of a deviation from an interpretable written prescription, including written modification to the prescription made.

D. Data Collection and Analysis

Data collection was used consists of: work flow of medication dispensing system in OPD 2nd floor; input: staff (number per day), equipment, time used, number of out-patient prescription per day; Process: how to detect medication error, what to do after detection, how to solve problems; Output: numbers of medication error detected at each step, sources of medication errors, types of dispensing error detected. Data were analyzed descriptively by frequency and tipe of errors, and recommendations made by interview and theoritical approach.

III. RESULTS

A. Frequency of errors

During 28 days of study period, number of prescription were 20,775 prescription, and 348 cases of dispensing errors were reported (1.67%). Dispensing errors recorded during working days are 12 events. However, trend of dispensing errors per se seems have not similar pattern (Figure 1). Prevalence of prescribing error was the highest (44.8%), The second was the prevalence of wrong dosage 32.2, and the third was preparation errors 25.9% (Figure 3). Medication dispensing error related to similar drug name was 19.8%. The error identified are Metronidazole read as Methimazole, Cardura XL® read as Xatral XL®, Tamoxifen read as Tenoxicam, and Azathioprine read as Methotrexate. Wrong patient recorded 0.6% of total dispensing errors. These finding is inaccordance with the proportion of branded drugs in cases (62.6%) (Figure 2). Due to thousands of branded drugs name in the market, mistype and misread along with prescription process would be increasing.

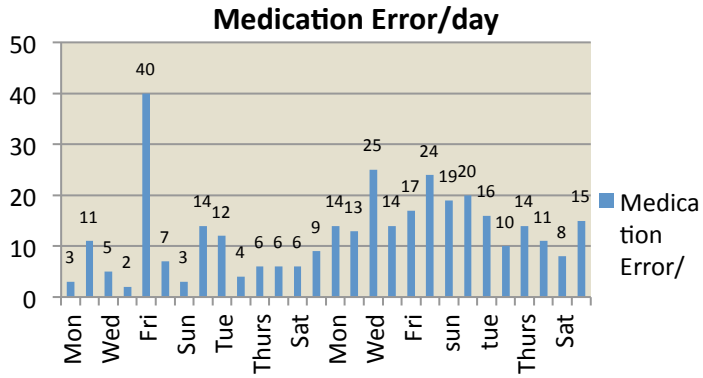

Figure 1. Dispensing error identified each day

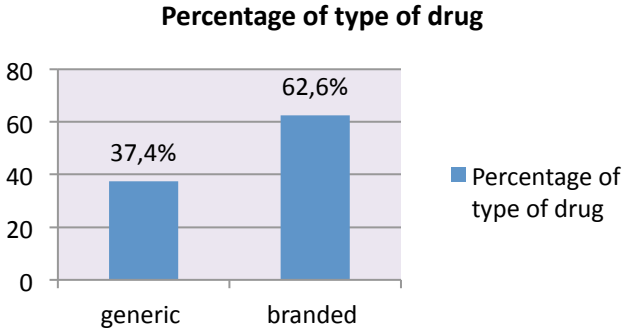

Figure 2. Proportion of generic drugs in dispensing errors

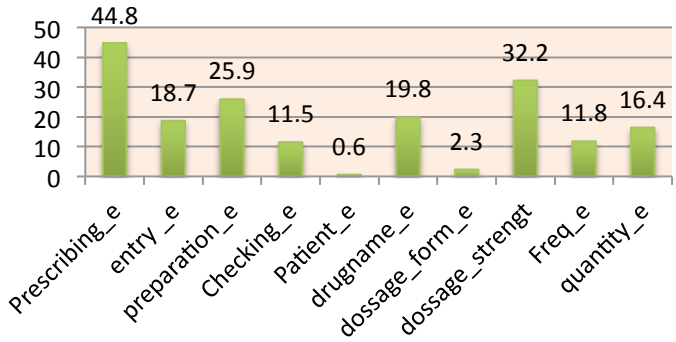

Figure 3. Proportion of types of errors

B. Workflow of Dispensing system

Workflow of dispensing system in OPD 2nd floor already integrated medication error reporting system. Pharmacists developed and implemented Medication Error Program as an instrument to report the medication dispensing errors routinely. According to American Society of Hospital Pharmacy (ASHP), an accurate dispensing system helps to prevent and reduce medication errors by minimizing the opportunity for dispensing errors in a pharmacy [9]. In order to reduce or prevent medication errors, it can be suggested that workflow in 2nd floor OPD considered to modify a little bit of workflow system. During observation, medication errors

detection in each step of workflow is partially employed. Consequently, the number of total errors reported here likely underestimates the true overall rate of dispensing errors.

Resources in OPD 2nd floor seem better than other hospitals in Thailand and developing countries as well. They have skillful staffs and equipments to support the best performance of drug services. They divided working hour into three shifts a day, each shift consists of 10 pharmacists and 11 pharmacist assistants, to give dispense medication at least from six clinics. Because of heavy workload, they need 30-45 minutes on average to dispense medication for each patient. They must serve at least 741 prescriptions per day. This finding also could be explained by pharmacist workload, in that more drugs/patient may indicate a higher workload for the pharmacy (medication orders/hour). It was consistent with previously study was shown that the risk of medication errors increases substantially when the number of medication orders/hour increases [13].

IV. DISCUSSIONS

Medication errors detection in the OPD is quite comprehensive. They employed double-checking method to make sure that any activities potentially lead medication errors can be prevented. Only 1.67% medication errors were recorded during 28 working day. Quite low compare with the result of other studies. Each day they recorded medication errors 12 events. The reasons for lower rates of total medication errors and medication errors in this hospital are unknown. It may be caused by unreported errors. Survey in United States Hospitals showed that 5.07% medication errors occurred each year [14].

Trend of medication errors day per day seems have not similar pattern. During first week observation, medication errors were reported in low frequency, except at Friday of first week. Medication errors reported in that day were 40 events as shown in the Figure 1. In order to detect root causes of that problem, staffing analysis during medication errors detected is needed, to know those who taken responsibility on that and how to communicate with others to prevent the same problem occurred on next period.

Since the prevalence of prescribing error was the highest (44.8%), we recommended that pharmacists have to develop good communication to physicians, to talk together how to solve these problems. It can be suggested to develop direct communication using intranet system, so pharmacist can directly contact physician if they found some mistakes or unclear informations on prescription. Clarification obtained from the physician should be promptly documented. Nair (2010) suggested that all verbal prescriptions should be immediately transcribed to a blank prescription pad and read back to the caller to ensure that the prescription has been transcribed correctly [15].

The most critical step for medication dispensing errors prevention is in the first level, at the transcription of prescription data on the computer by pharmacist assistant. Previous study recorded transcription errors (eg, omissions, inaccuracies) account for 15% of all dispensing errors [16]. These errors can be reduced by consistently using reliable methods to verify patient identity while entering the prescription into the computer. Find out prescribing errors will prevent errors in the drug preparation, and finally it will reduce dispensing errors events.

Medication dispensing error related to similar drug name was 19.8%. The error identified are Metronidazole read as Methimazole, Cardura XL® read as Xatral XL®, Tamoxifen read as Tenoxicam, and Azathioprine read as Methotrexate. Manual writing may complicate the distinction between 2 drugs with similar names. Many drugs have similar names or drug names may sound similar, leading to confusion, particularly when they are delivered through the same route or have similar dosages. Similar drug names are responsible for over one third of medication errors reported in the United States Pharmacopoeia Medication Errors Reporting Program (USPMERP). Nair (2010) suggested to use Tall Man Letter to reduce the mistake when take the drug from the storage [15]. Pharmacists in OPD already used this method to solve the drug name/sound like confusion.

Prevalence of wrong dosage in this study was 32.2%. Quite high compare to the previous studies. A study published in 1997 found that 11.4% of 2103 medication errors were due to the wrong drug or dosage and a 1995 study found that 11% of medication errors were pharmacy dispensing errors related to the wrong drug or incorrect strength [17, 18]. The most drugs frequently related to wrong dose/strength are Lyrica®, Arcoxia®, Serc®, Calcium carbonat, Controloc®, and Euthyrox®. It was caused by each drug have different strength in one brand, and assistant didn't re-check before drug prepared. Solution for this problem is using separate shelves for the drug, which have different strength and distribute the information that some drugs have different strength in one brand. University hospital already used the first method and are suggested to used the second one.

About medication errors related to administration of drug, it was occurred due to drug labeled mistyped during prescription data entry, so the label printed will be wrong as well. Frequency and quantity error in OPD were 11.8% and 16.4% respectively. It might be caused by illegible handwritten prescription or different administration or frequency of the drugs. Problems related to drug labeling and packaging are the second most reported category in the most frequent medication errors reported to the USP-MERP and are responsible for about 20% of notifications [7]. Assistant tend to generalize that every same drug will be have similar administration frequency for each patient. One of methods to prevent this problem is pay attention more on first checking, when label of medication is produced and re-check on the second checking. Avoid distraction or interruption during data entry is a requirement [11]. Another study conducted during 23 days in 1994 compared dispensing error rates in work environments with varying interruption levels, distractions, noise, and work overload, and found that error rates were 3.23% and 1.23% in

environments with higher and lower levels of these variables, respectively [19].

Although causes were not systematically recorded during this 28 days study, the multiple of factors contributing to dispensing errors has been reported to, include of communication failures, working environment, heavy workload, distractions, failure to read the prescription, and the workflow itself. According to Anacleto [11], the most significant cause of dispensing errors in community and outpatient pharmacies is work overload. Studies have demonstrated a direct relationship between errors and work overload. Stress caused by imposing a maximum time limit for dispensing the prescription is a significant factor. The most obvious solution for work overload is to have enough trained staff and to increase the time limit for dispensing the prescription. Institute for Safe Medication Practices suggested that encourage staffs to detect medication dispensing errors, and awareness of medication dispensing errors is better than blame each other [6]. According to Cohen [7] patient counseling means additional safety against medication errors. Studies have shown that 83% of errors were discovered during interviews with patients and corrected before they had left the pharmacy. Supports the role of the pharmacist are the key component in the prevention and management of medication errors in the system. Pharmacist must be a risk manager particularly in OPD. Pharmacists, in conjunction with other health care professionals, must continually collect data on and evaluate the medication use process as part of an ongoing quality improvement program in order to minimize the risk of medication errors. Lack of adequate training or supervision of pharmacy assistants also contributes to medication errors. Many developing countries only have one pharmacist in community and outpatient department as well, which means that the work of the pharmacy assistant goes mostly unsupervised and unchecked.

One of the pharmacist's missions is to ensure that patients make the best use of medications. This is in accordance with the Institute of Medicine's recommendations, which seek to improve the quality and safety of medication use. The report lays out a blueprint for how pharmacists can become involved in the medicine dispensing process in order to improve it [6].

Finally, it can be recommended that medication errors prevention should include all components in the system. First level prevention (transcribing prescription) as a critical point, it can be suggested to set a pharmacist for accurately checking. At the end of each day, an assistant checks the accuracy of computer information from the previous shift and resolve discrepancies together among teamwork. System approach included improvement of dispensing system, routinely training, run the duty 'every pharmacist is a risk manager', monitoring and handling errors, self audit, review medication dispensing errors recorded at least once every 3 months start from staffing level, workflow, and technological support if possible.

V. CONCLUSIONS

Prevalence of errors seems low but it is urgent to encourage staffs for detection and make solution for these problems. It is expected that staffs increased the awareness regarding to the reality and potential severity of medication dispensing errors. Building good system to encourage medication errors reporting and prevention might be considered to ensure the commitment of patient safety. Dispensing errors reported by pharmacist must be seen by the pharmacy institution-related as opportunities to identify areas for improvement.

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